



wwPDB EM Validation Summary Report ⓘ

Mar 9, 2026 – 11:53 PM UTC

PDB ID : 9EAJ / pdb_00009ej
EMDB ID : EMD-47833
Title : Structure of nanobody AT206 in complex with the angiotensin II type I receptor (AT1R)
Authors : Skiba, M.A.; Kruse, A.C.
Deposited on : 2024-11-11
Resolution : 3.20 Å(reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

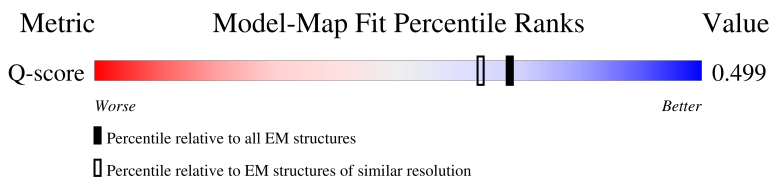
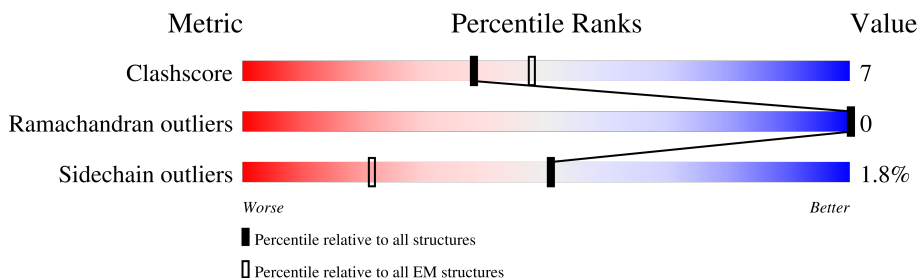
EMDB validation analysis : 0.0.1.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	15020 (2.70 - 3.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	583	<p>5% (poor fit), 51% (0 outliers), 11% (1 outlier), 37% (not modelled)</p>
1	B	583	<p>9% (0 outliers), 89% (not modelled)</p>
2	C	231	<p>18% (poor fit), 44% (0 outliers), 8% (1 outlier), 47% (not modelled)</p>
3	D	215	<p>16% (poor fit), 35% (0 outliers), 15% (1 outlier), 49% (not modelled)</p>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5246 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Nanobody AT206, Type-1 angiotensin II receptor, Soluble cytochrome b562.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	365	2906	1933	455	503	15	0	0
1	B	66	561	368	92	98	3	0	0

There are 100 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-14	GLY	-	linker	PDB ?
A	-13	GLY	-	linker	PDB ?
A	-12	SER	-	linker	PDB ?
A	-11	GLY	-	linker	PDB ?
A	-10	GLU	-	linker	PDB ?
A	-9	ASP	-	linker	PDB ?
A	-8	GLN	-	linker	PDB ?
A	-7	VAL	-	linker	PDB ?
A	-6	ASP	-	linker	PDB ?
A	-5	PRO	-	linker	PDB ?
A	-4	ARG	-	linker	PDB ?
A	-3	LEU	-	linker	PDB ?
A	-2	ILE	-	linker	PDB ?
A	-1	ASP	-	linker	PDB ?
A	0	GLY	-	linker	PDB ?
A	1	LYS	-	linker	PDB ?
A	232	TRP	MET	engineered mutation	UNP P0ABE7
A	327	ILE	HIS	engineered mutation	UNP P0ABE7
A	331	LEU	ARG	engineered mutation	UNP P0ABE7
A	332	GLU	-	linker	UNP P0ABE7
A	333	ARG	-	linker	UNP P0ABE7
A	334	ALA	-	linker	UNP P0ABE7
A	335	ARG	-	linker	UNP P0ABE7
A	336	SER	-	linker	UNP P0ABE7
A	337	THR	-	linker	UNP P0ABE7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	338	LEU	-	linker	UNP P0ABE7
A	339	ASP	-	linker	UNP P0ABE7
A	340	LYS	-	linker	UNP P0ABE7
A	341	LEU	-	linker	UNP P0ABE7
A	1320	GLY	-	expression tag	UNP P30556
A	1321	GLY	-	expression tag	UNP P30556
A	1322	SER	-	expression tag	UNP P30556
A	1323	SER	-	expression tag	UNP P30556
A	1324	LEU	-	expression tag	UNP P30556
A	1325	GLU	-	expression tag	UNP P30556
A	1326	VAL	-	expression tag	UNP P30556
A	1327	LEU	-	expression tag	UNP P30556
A	1328	PHE	-	expression tag	UNP P30556
A	1329	GLN	-	expression tag	UNP P30556
A	1330	GLY	-	expression tag	UNP P30556
A	1331	PRO	-	expression tag	UNP P30556
A	1332	THR	-	expression tag	UNP P30556
A	1333	GLU	-	expression tag	UNP P30556
A	1334	THR	-	expression tag	UNP P30556
A	1335	SER	-	expression tag	UNP P30556
A	1336	GLN	-	expression tag	UNP P30556
A	1337	VAL	-	expression tag	UNP P30556
A	1338	ALA	-	expression tag	UNP P30556
A	1339	PRO	-	expression tag	UNP P30556
A	1340	ALA	-	expression tag	UNP P30556
B	122	GLY	-	linker	PDB ?
B	123	GLY	-	linker	PDB ?
B	124	SER	-	linker	PDB ?
B	125	GLY	-	linker	PDB ?
B	126	GLU	-	linker	PDB ?
B	127	ASP	-	linker	PDB ?
B	128	GLN	-	linker	PDB ?
B	129	VAL	-	linker	PDB ?
B	130	ASP	-	linker	PDB ?
B	131	PRO	-	linker	PDB ?
B	132	ARG	-	linker	PDB ?
B	133	LEU	-	linker	PDB ?
B	134	ILE	-	linker	PDB ?
B	135	ASP	-	linker	PDB ?
B	136	GLY	-	linker	PDB ?
B	137	LYS	-	linker	PDB ?
B	368	TRP	MET	conflict	UNP P0ABE7

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Chain	Residue	Modelled	Actual	Comment	Reference
B	463	ILE	HIS	conflict	UNP P0ABE7
B	467	LEU	ARG	conflict	UNP P0ABE7
B	468	GLU	-	linker	UNP P0ABE7
B	469	ARG	-	linker	UNP P0ABE7
B	470	ALA	-	linker	UNP P0ABE7
B	471	ARG	-	linker	UNP P0ABE7
B	472	SER	-	linker	UNP P0ABE7
B	473	THR	-	linker	UNP P0ABE7
B	474	LEU	-	linker	UNP P0ABE7
B	475	ASP	-	linker	UNP P0ABE7
B	476	LYS	-	linker	UNP P0ABE7
B	477	LEU	-	linker	UNP P0ABE7
B	563	GLY	-	expression tag	UNP P30556
B	564	GLY	-	expression tag	UNP P30556
B	565	SER	-	expression tag	UNP P30556
B	566	SER	-	expression tag	UNP P30556
B	567	LEU	-	expression tag	UNP P30556
B	568	GLU	-	expression tag	UNP P30556
B	569	VAL	-	expression tag	UNP P30556
B	570	LEU	-	expression tag	UNP P30556
B	571	PHE	-	expression tag	UNP P30556
B	572	GLN	-	expression tag	UNP P30556
B	573	GLY	-	expression tag	UNP P30556
B	574	PRO	-	expression tag	UNP P30556
B	575	THR	-	expression tag	UNP P30556
B	576	GLU	-	expression tag	UNP P30556
B	577	THR	-	expression tag	UNP P30556
B	578	SER	-	expression tag	UNP P30556
B	579	GLN	-	expression tag	UNP P30556
B	580	VAL	-	expression tag	UNP P30556
B	581	ALA	-	expression tag	UNP P30556
B	582	PRO	-	expression tag	UNP P30556
B	583	ALA	-	expression tag	UNP P30556

- Molecule 2 is a protein called BAG2 Anti-BRIL Fab Heavy Chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	122	944	604	158	179	3	0	0

- Molecule 3 is a protein called BAG2 Anti-BRIL Fab Light Chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	D	109	835	527	138	167	3	0	0

THR
LYS
SER
PHE
ASN
ARG
GLY
GLU
CYS

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	120432	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	63.5	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.848	Depositor
Minimum map value	-0.514	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.009	Depositor
Recommended contour level	0.075	Depositor
Map size (Å)	292.16, 292.16, 292.16	wwPDB
Map dimensions	352, 352, 352	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.83, 0.83, 0.83	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.17	0/2973	0.28	0/4043
1	B	0.11	0/576	0.25	0/774
2	C	0.18	0/973	0.26	0/1327
3	D	0.19	0/853	0.31	0/1158
All	All	0.17	0/5375	0.28	0/7302

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2906	0	3000	38	0
1	B	561	0	519	11	0
2	C	944	0	886	14	0
3	D	835	0	813	21	0
All	All	5246	0	5218	77	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

The worst 5 of 77 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:234:THR:O	1:A:238:ASN:ND2	2.24	0.69
2:C:97:TYR:O	2:C:120:GLY:HA2	1.91	0.68
1:A:38:ILE:HG23	1:A:1296:CYS:HB2	1.81	0.63
3:D:30:VAL:HG11	3:D:91:GLN:HG3	1.80	0.62
1:A:86:VAL:HG22	1:A:90:MET:HE1	1.82	0.61

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	357/583 (61%)	348 (98%)	9 (2%)	0	100	100
1	B	56/583 (10%)	48 (86%)	8 (14%)	0	100	100
2	C	120/231 (52%)	117 (98%)	3 (2%)	0	100	100
3	D	107/215 (50%)	100 (94%)	7 (6%)	0	100	100
All	All	640/1612 (40%)	613 (96%)	27 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	315/497 (63%)	309 (98%)	6 (2%)	50	73
1	B	55/497 (11%)	54 (98%)	1 (2%)	51	74

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	C	97/192 (50%)	95 (98%)	2 (2%)	47	71
3	D	94/190 (50%)	93 (99%)	1 (1%)	65	79
All	All	561/1376 (41%)	551 (98%)	10 (2%)	51	74

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	C	53	TYR
2	C	65	ASP
3	D	70	THR
1	A	212	LEU
1	A	228	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	C	87	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

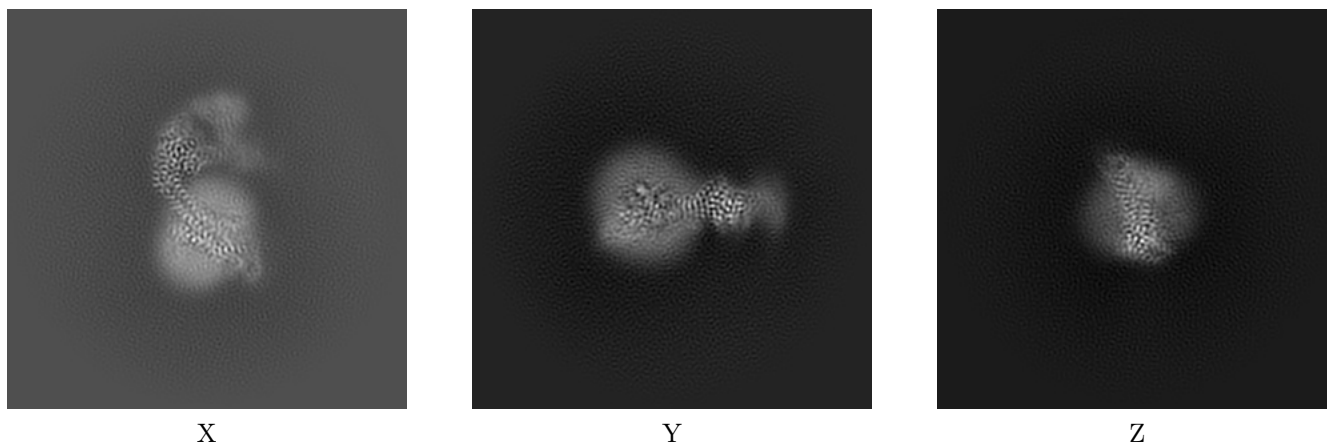
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-47833. These allow visual inspection of the internal detail of the map and identification of artifacts.

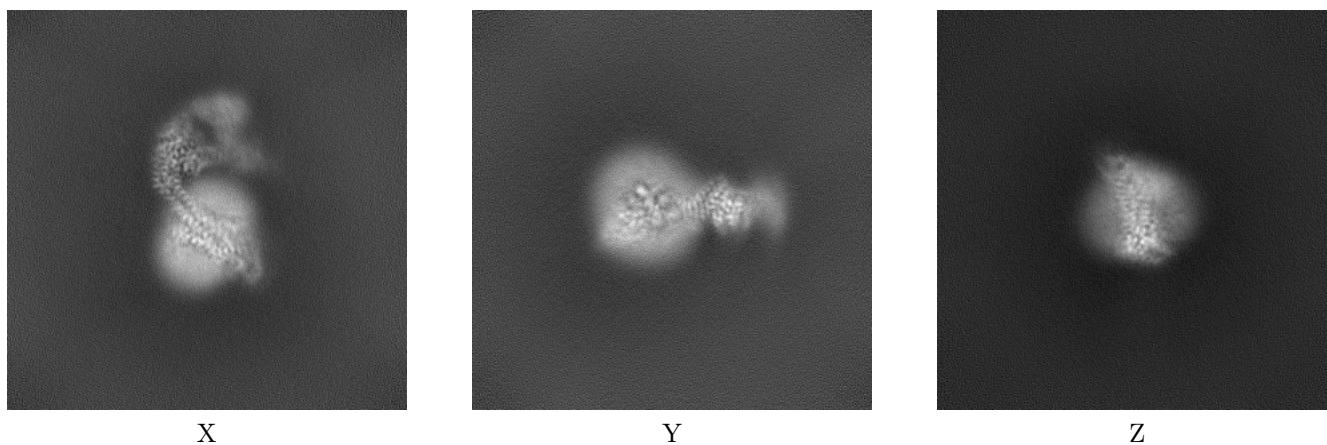
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

6.1.1 Primary map



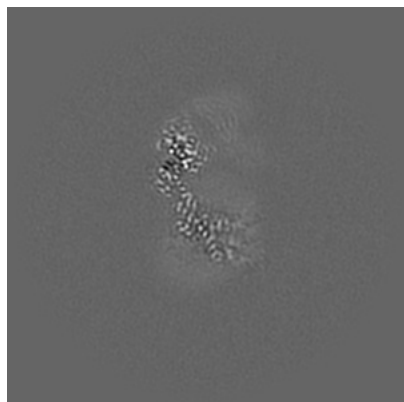
6.1.2 Raw map



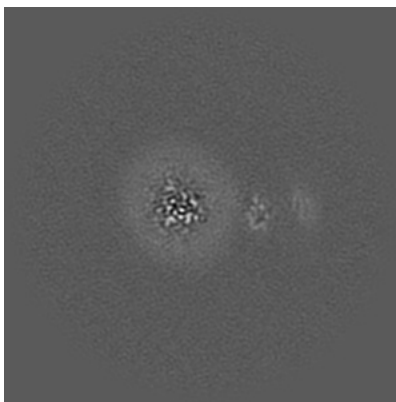
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

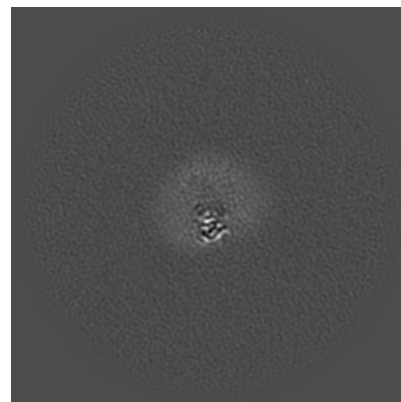
6.2.1 Primary map



X Index: 176

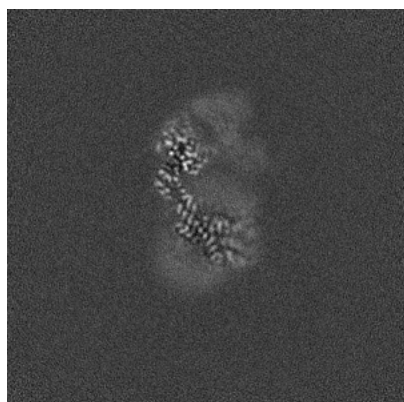


Y Index: 176

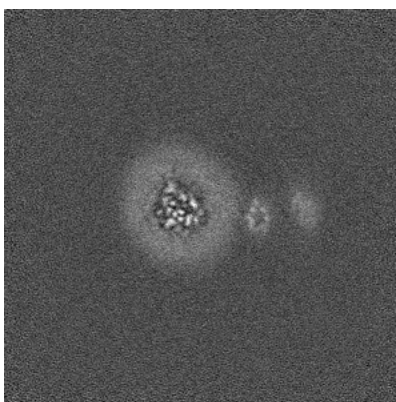


Z Index: 176

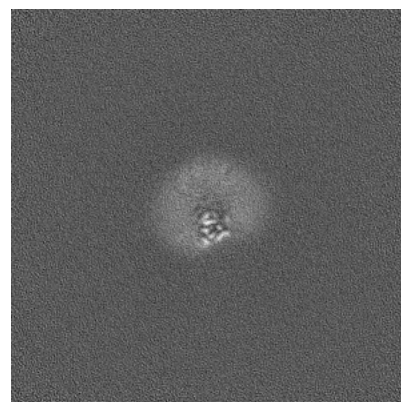
6.2.2 Raw map



X Index: 176



Y Index: 176

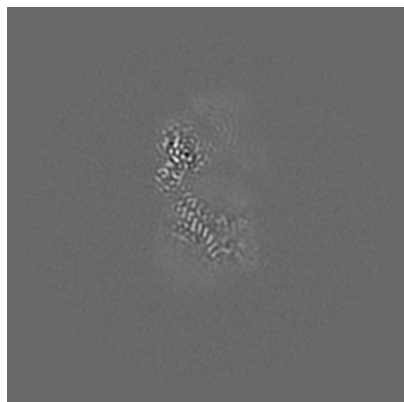


Z Index: 176

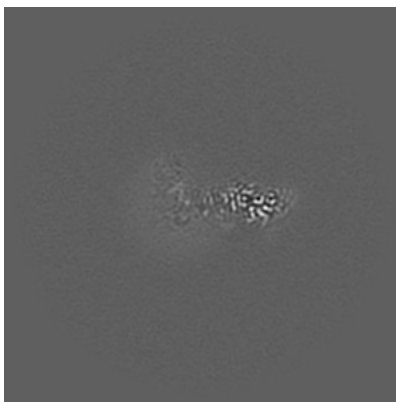
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

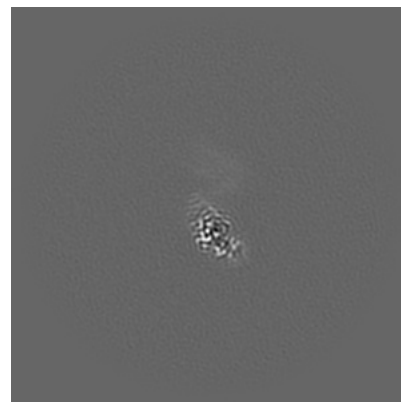
6.3.1 Primary map



X Index: 174

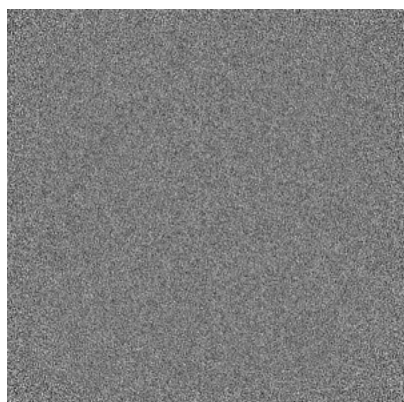


Y Index: 148

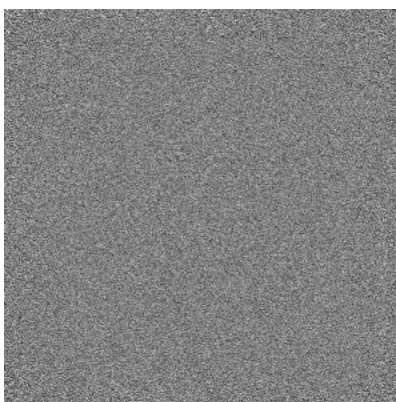


Z Index: 218

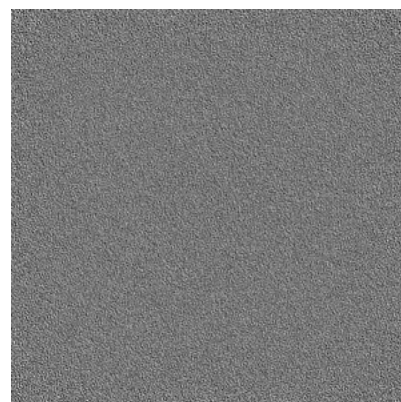
6.3.2 Raw map



X Index: 0



Y Index: 0

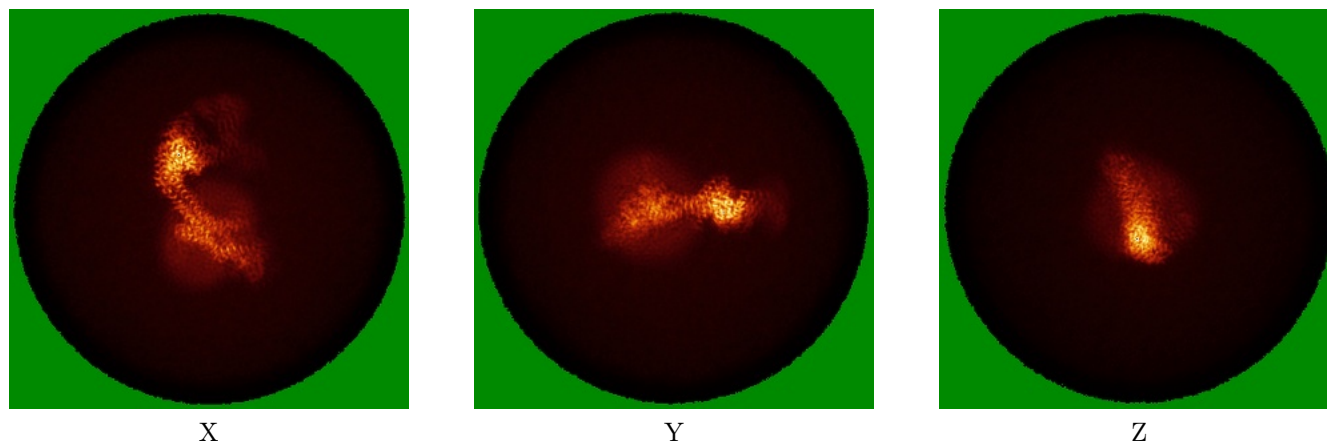


Z Index: 351

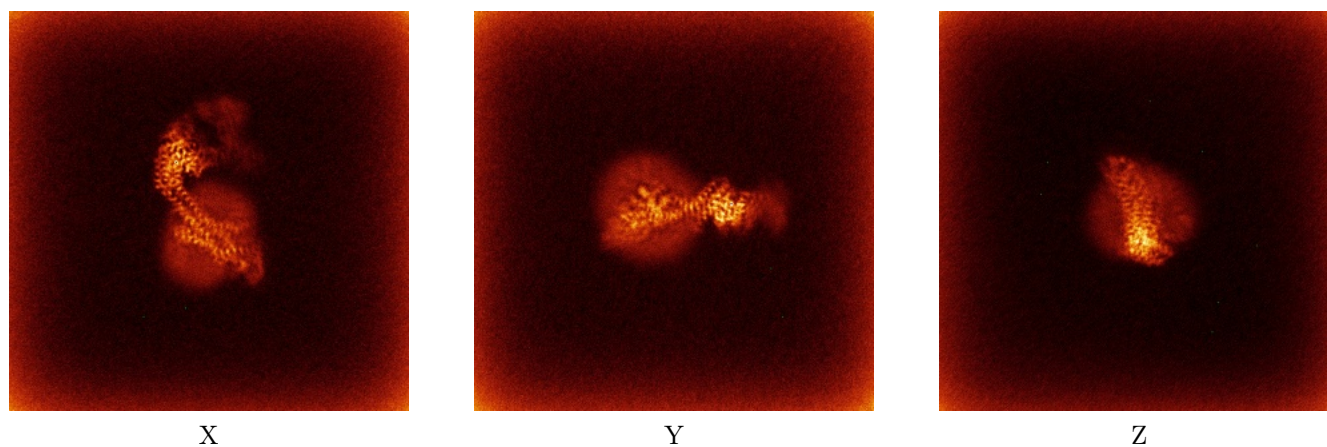
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

6.4.1 Primary map



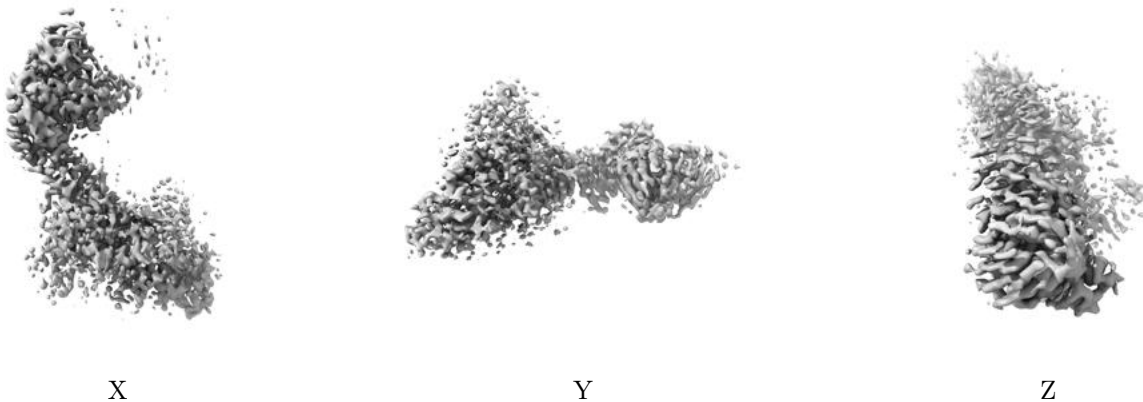
6.4.2 Raw map



The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

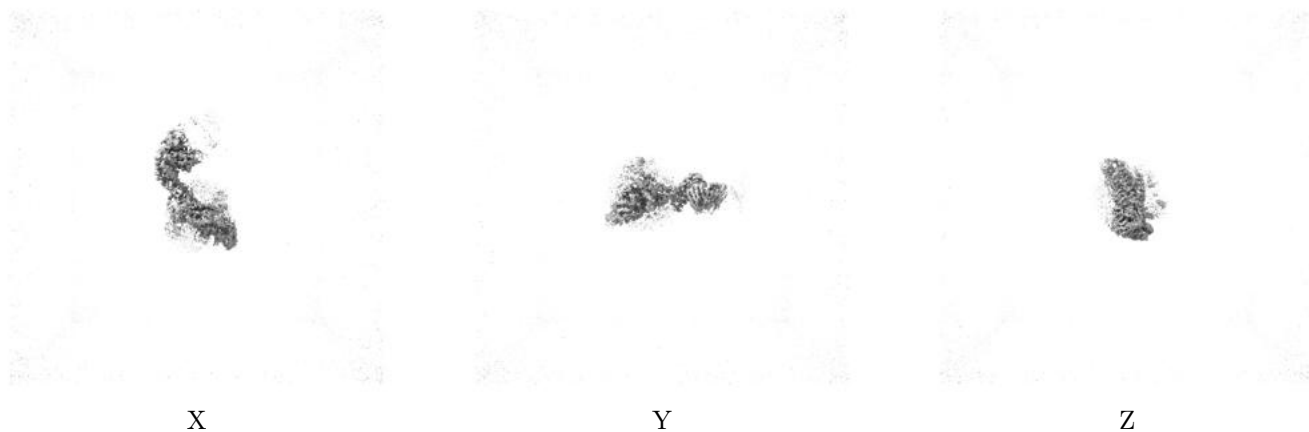
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.075. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

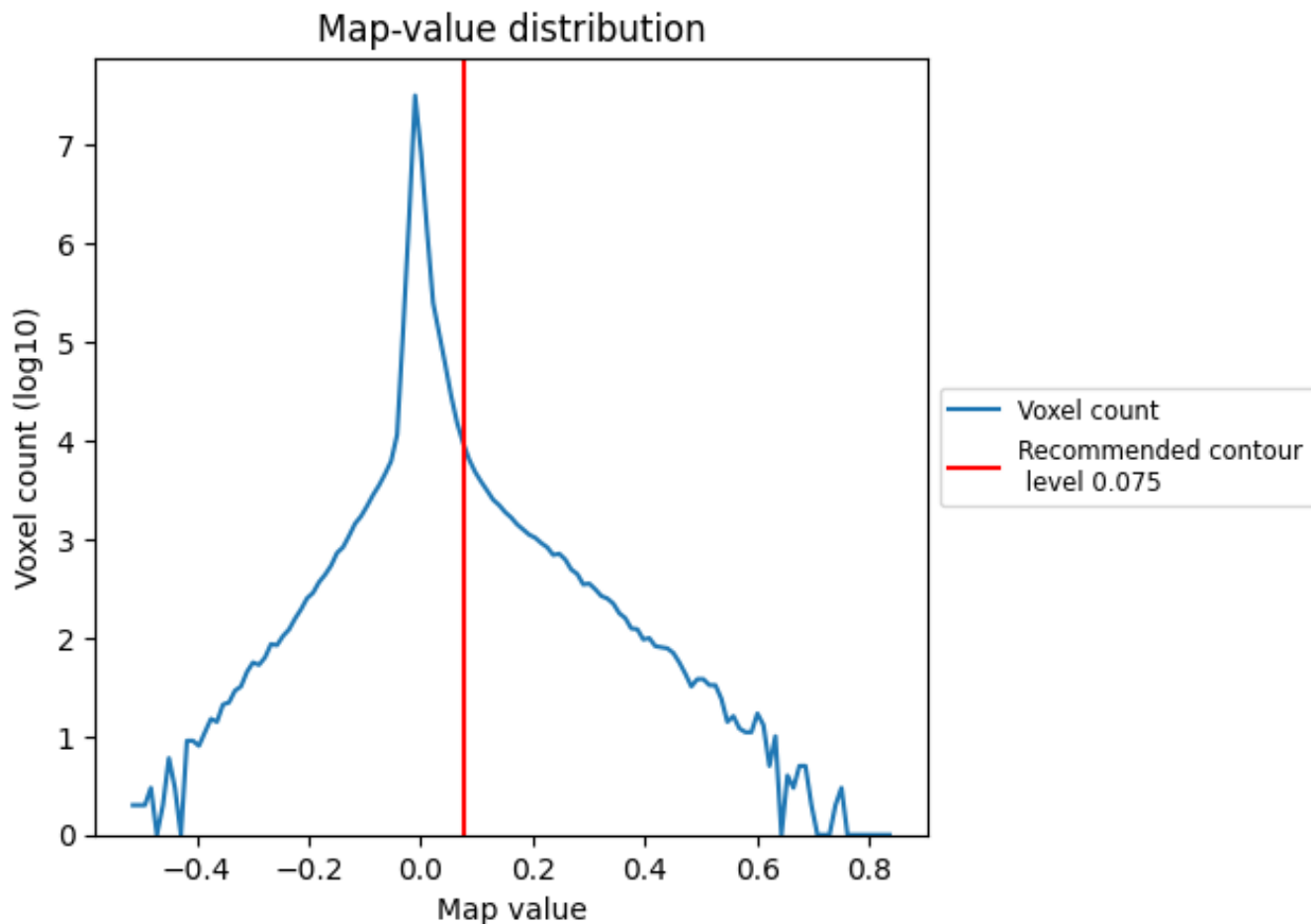
6.6 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

7 Map analysis [i](#)

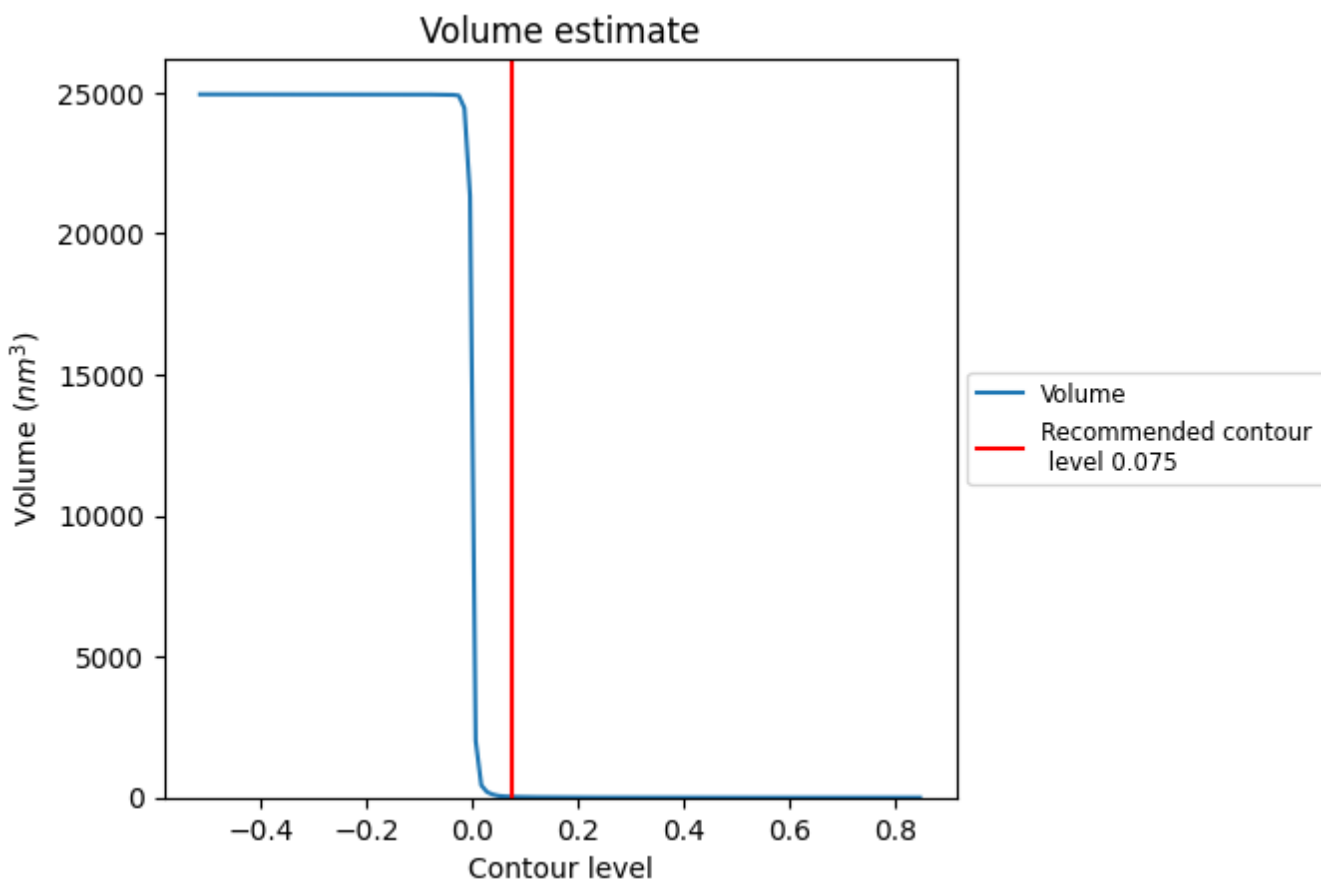
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

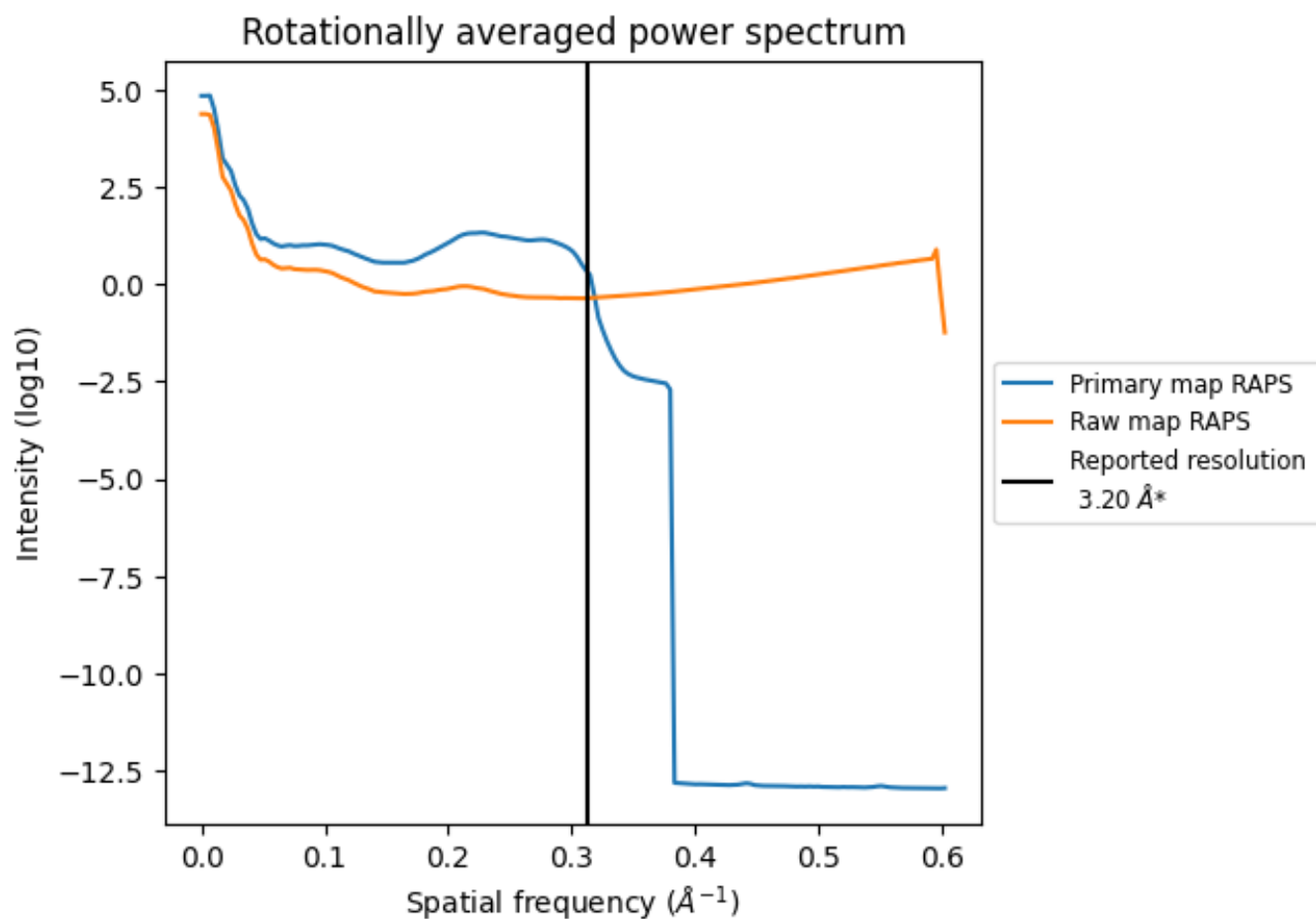
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 28 nm³; this corresponds to an approximate mass of 26 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum [i](#)

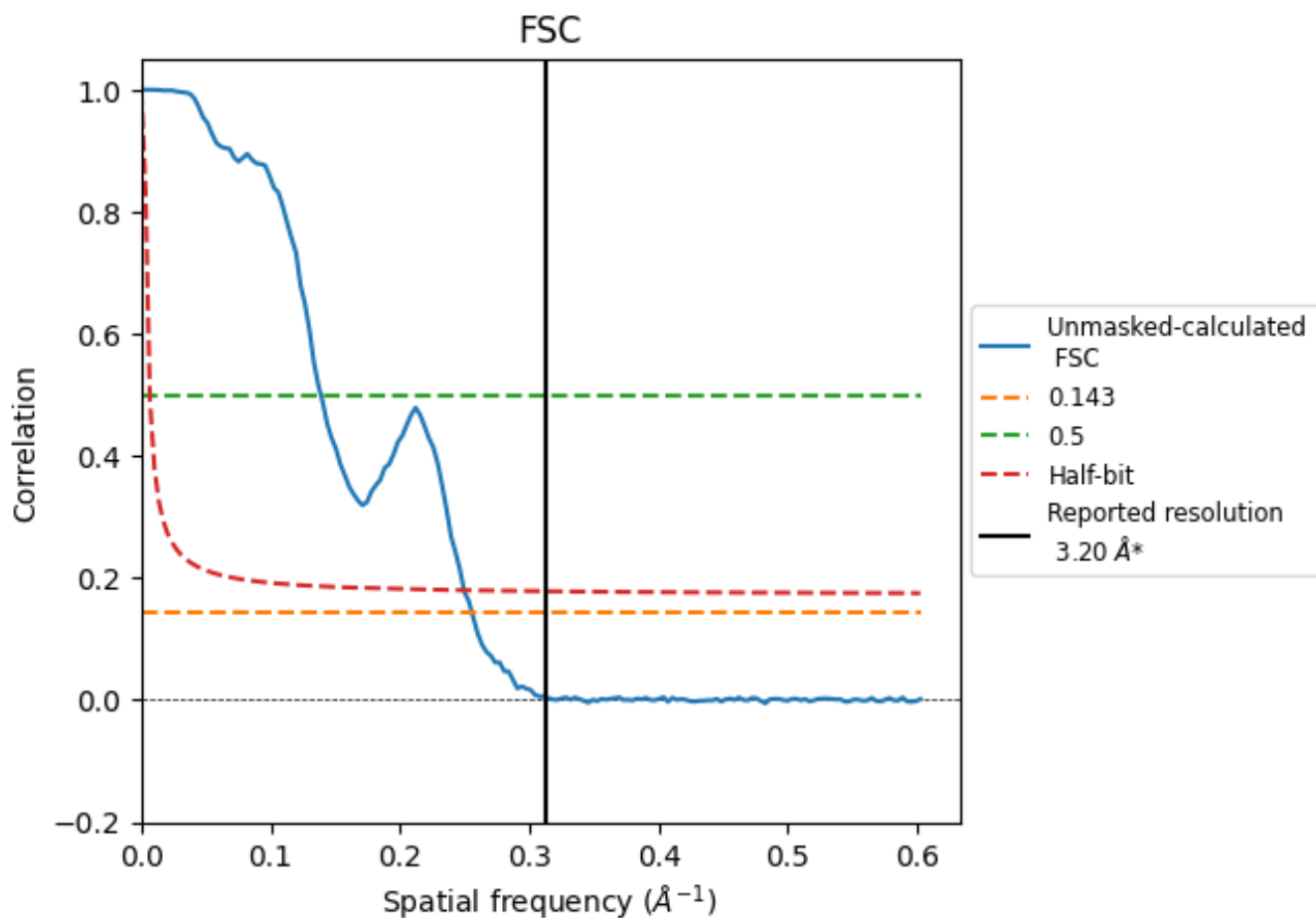


*Reported resolution corresponds to spatial frequency of 0.312 Å⁻¹

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.312 Å⁻¹

8.2 Resolution estimates [i](#)

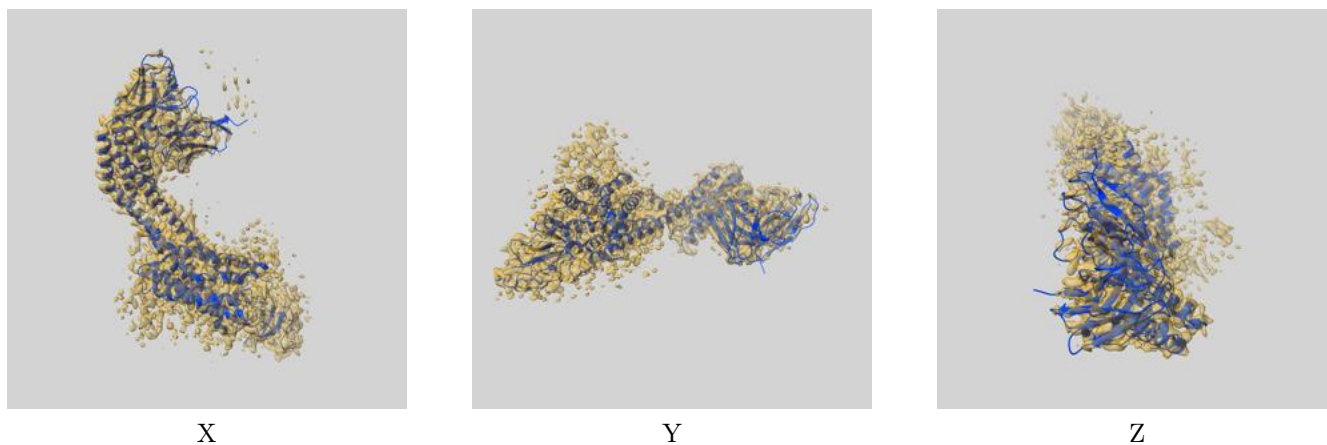
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.91	7.19	4.01

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.91 differs from the reported value 3.2 by more than 10 %

9 Map-model fit [i](#)

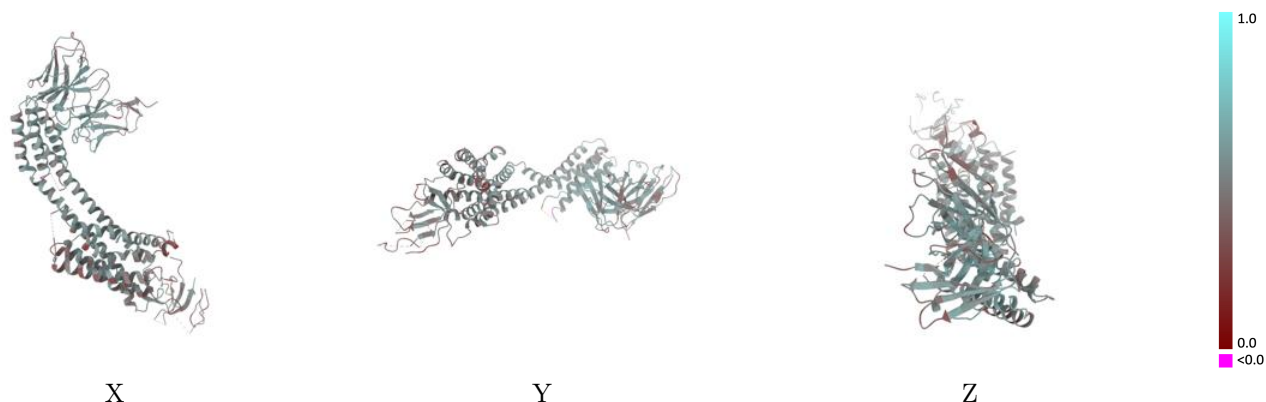
This section contains information regarding the fit between EMDB map EMD-47833 and PDB model 9EAJ. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay [i](#)



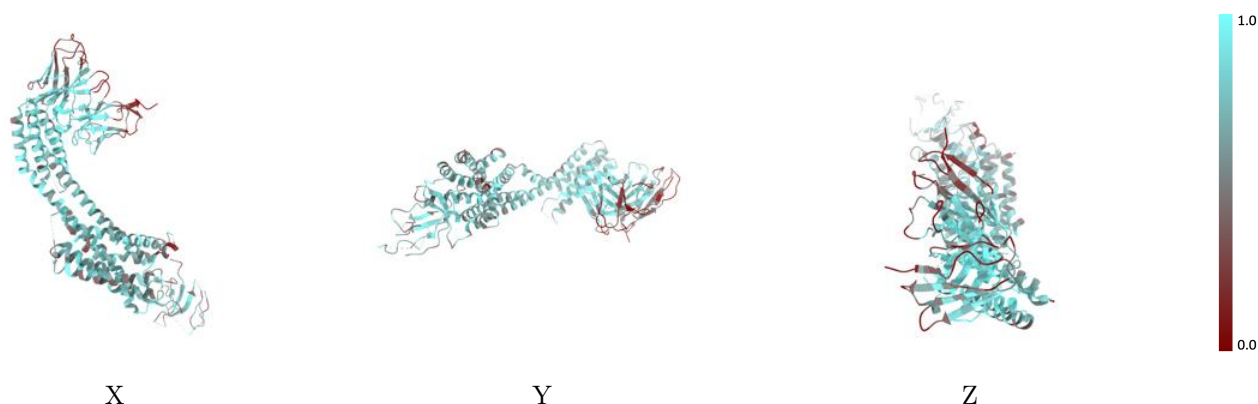
The images above show the 3D surface view of the map at the recommended contour level 0.075 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [\(i\)](#)



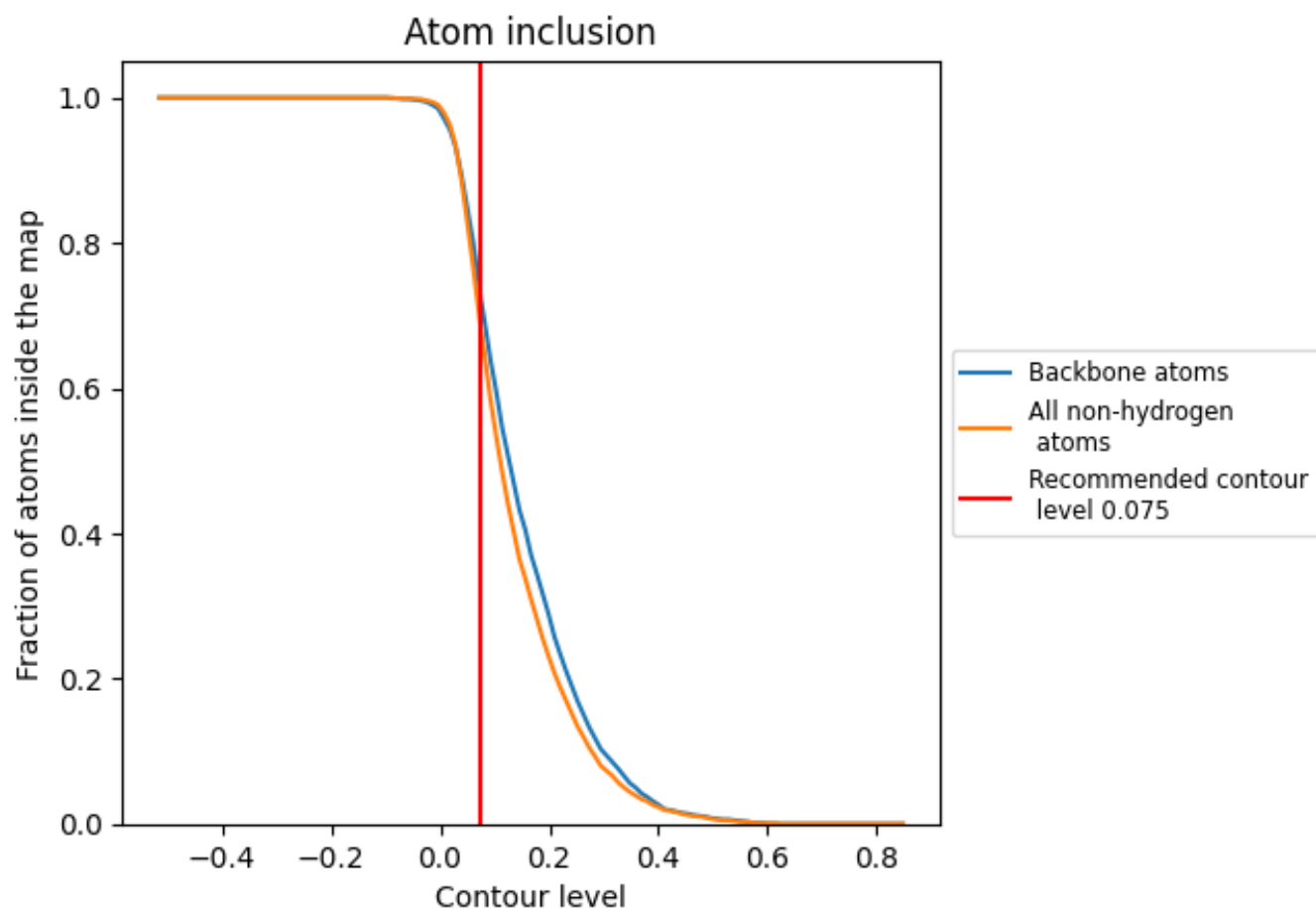
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [\(i\)](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.075).











9.4 Atom inclusion [i](#)



At the recommended contour level, 72% of all backbone atoms, 68% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.075) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6790	 0.4990
A	 0.7290	 0.5000
B	 0.6180	 0.4300
C	 0.6190	 0.5180
D	 0.6100	 0.5180

